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Climate Change Impacts: An Appraisal of Women Crop Farmers in the Central Region of Ghana

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Abstract

Women are essential contributors to the food basket of the Ghanaian economy. This study was centred on the level of adaptive capacity of women crop farmers in the Agona West Municipality in the Central Region of Ghana. The research approach employed for this study was survey method. The target population for the study was 291 which were sampled based on Krejcie and Morgan's (1970) table for determining sample size out of 1200 women crop farmers in the Agona municipality. The main tool used for data collection was questionnaires, through open and closed ended questions from women farmers in the Agona Swedru, Nkum, Abodom, Bobikuma, Nyakrom and Ostenkorang communities. The researchers applied statistical analysis to the data collected from the field through the use of questionnaire in the study. A vulnerability index was developed using indicators from the Human Development Index (HDI). The study revealed that, access to weather information which increases adaptive capacity was not accessible by all and this also leads to a reduced adaptive capacity. The study also concluded that access to loan facilities is crucial in enhancing farmers' adaptive capacity. The study recommended that, government through the extension services is to ensure improvement in the mass education of farmers to enlighten them on new technologies employed in farming.

Keywords

Climate Change, Women Crop Farmers, Agona West Municipality, Central Region, Ghana

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1. Introduction and Background

Climate is considered as one of the most important and primary determinants of agricultural production [1]. With agriculture being one of the most susceptible sectors to changing climate, climate change is also expected to increase price volatility for agricultural commodities, and reduce food quality [2]. Farmers' ability to adapt to these changes however, is highly dependent on their social, economic and environmental conditions.

Adaptive capacity is projected to be reduced in regions closest to the equator if temperatures increase by 3°C or more [1]. The agricultural industry is best served by ambitious approaches to adaptation and to cutting emissions. Greenhouse gas (GHG) emissions from agriculture comprised about 10–12% of man-made GHG emissions in

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2010. The sector is the largest contributor of non-carbon dioxide (non-CO_2) GHGs such as methane [3]. Though Ghana's agricultural potential is high, climate change keeps agricultural production below its potential. Subsistence farms make up the majority of both male and female-held total farms, 78% and 73% respectively. This leaves the percentage of market-oriented farms at 22% for male-held farms and 27% for female-held farms. Female-led farms, especially those that are medium or large, appear to be more market-oriented than those held by men [4].

It is estimated that about 80 percent of rural land in Ghana is regulated under customary law. It is the responsibility of lineage chiefs to lead community decision-making with regards to the distribution of land plots [5]. In practice, however, male heads of families are in charge of setting up land tenure arrangements, sometimes even in matrilineal societies. The result is that women's access to and use of land is through their male counterparts [4]. Moreover, there are differences in crop diversity depending on the gender of the holder and type of farming activity. Among subsistence farms held by women, there is less diversity in crop type as most harvest maize (50% compared to 35% in male-led farms). Gender disparities in agriculture emerge as less female farmers adopt improved crop varieties, compared with more male farmers, because they have less access to land, family labour and extension services [6]. Ghanaian women also own less livestock, use less fertilizers, own less mechanical equipment, have less years of education and school attendance rates than men [4]. Even though the contribution of women in agriculture is immense, they are still susceptible to the impacts of climate change as a result of a combination of a number of factors including gender-based cultural norms, inheritance structures and household responsibilities. Farmers of the Agona West Municipality, the case study for this research share similar characteristics as that of farmers in other parts of the country in terms of cultural or gender disparities, environmental and climatic conditions. Agriculture, the major economic activity in Agona West engages more than 64% of the municipal population and is heavily impacted upon by climate change. Flooding resulting from intense rainfall is another factor impeding the efforts of farmers with the worst flooding scenario occurring in 2011. For this reason, the municipality has begun incorporating measures that would build the resilience of sensitive sectors including agriculture, water and health [7].

Increasing agricultural produce is however hampered by a number of factors including climate change. Climate change is expected to impact on the agricultural sector in multiple ways, among others through increased variability with regard to temperature, rain, frequency and intensity of extreme weather events, changes in rain patterns and in water availability and through perturbations in ecosystems. The main effects on agricultural production are expected to be an increased variability of production, decrease of production in certain areas and changes in the geography of production. One way to cope with the challenges comprised by climate change is to build resilience for adaptation in the agriculture sector; on the contrary inability to adapt to climate change increases vulnerability [8].

The repercussions of climate change as experienced by farmers in the Agona West Municipality Assembly are also not gender - neutral and these differences can be placed on the existing marginalization against women in the society. Women are more severely affected by climate change and natural disasters because of their social roles, economic and political discrimination and poverty. Coupled with unequal access to resources and to decision-making processes, women in rural areas are disproportionately affected by climate change [9]. The purpose of the study was to ascertain the women crop farmers' capabilities of adapting to climate change impacts. The study sought to answer the research question - To what extent are women crop farmers in the Agona West Municipality capable of adapting to climate change impacts?

2. Review of the Literature on Adaptive Capacity to Climate Change Impacts

Adaptive capacity denotes the ability of a system to adjust, modify or change its characteristics and actions to moderate potential future damage; take advantage of opportunities; and to cope with the consequences of shock or stress [10]. Adaptive capacity refers to the potential or capability of a system to adjust to climate change, including climate vulnerability and extremes, so as to moderate potential damages, to take advantage of opportunities, or to cope with consequences [11]. As suggested by the name, adaptive capacity is the capability of a system to adjust to impacts of climate change. Adaptive capacity as the ability (or potential) of a system to adjust successfully to climate change (including climate variability and extremes) to: (i) moderate potential damages; (ii) to take advantage of opportunities; and/or (iii) to cope with the consequences [3]. Adaptive capacity is a significant factor in characterizing vulnerability. In climate change literature, adaptive capacity is similar or closely related to a host of other commonly used concepts such as adaptability, coping ability, management capacity, stability, robustness, flexibility, and resilience [12]

Adaptive capacity comprises adjustments in both behaviour

and in resources and technologies [13]. Recent literature emphasizes the importance of socio-economic factors for the adaptive capacity of a system, especially highlighting the integral role of institutions, governance and management in determining the ability to adapt to climate change [10, 11, 13]. Adaptive capacity is generally accepted as a desirable property or positive attribute of a system for reducing vulnerability [14]. The more adaptive capacity a system has, the greater is the likelihood that the system is able to adjust and thus is less vulnerable to climate change and variability. Adaptive capacity represents the potential of a system to adapt rather than the actual adaptation [10]. However, seven factors that determine adaptive capacity. They include wealth, technology, education, institutions, information, infrastructure and social capital [11]. These factors can successfully be used as indicators of adaptive capacity.

Analyzing vulnerability involves identifying not only the threat, but also the "resilience," or the responsiveness of the system and its ability to exploit opportunities and resist or recover from the negative effects of a changing environment [15]. The means of resistance are the assets and entitlements that the individuals, households, or communities can mobilize and manage in the face of hardship. There are close linkages between vulnerability and livelihoods, and building resilience is a question of expanding and sustaining these assets [16]. Vulnerability is therefore closely linked to asset ownership. The more assets people have, the less vulnerable they are; conversely, the greater the erosion of people's assets, the greater their insecurity.

In this research, adaptive capacity is described as being dependent upon the following factors:

1. Experience in farming

Farmer experience increases the probability of uptake of all adaptation options. Highly experienced farmers are likely to have more information and knowledge on changes in climatic conditions and crop and livestock management practices. Experienced farmers are usually leaders and progressive farmers in rural communities and they can be targeted in promoting adaptation management to other farmers who do not have such experience and are not yet adapting to changing climatic conditions [17]. Making use of local successful lead farmers as entry points in promoting adaptation among smallholder farmers can have significant positive impacts in increasing use of various adaptation options. Farming experience could be an index of the degree to which the farmer has been exposed to the existing farm practices and technology and, perhaps, the degree of his willingness to accept new innovation.

2. Availability and accessibility of the weather forecast

Farmers who are aware of changes in climatic conditions have higher chances of taking adaptive measures in response to observed changes. It is an important precondition for farmers to take up adaptation measures [17]. Raising awareness of changes in climatic conditions among farmers would have a greater impact in increasing adaptation to changes in climatic conditions. It is therefore important for governments, meteorological departments, and ministries of agriculture to raise awareness of the changes in climatic conditions through appropriate communication pathways that are available to farmers such as extension services, farmer groups, input and output dealers, radio and television among others. These need to be accompanied by the various crop and livestock management practices that farmers could take up in response to forecasted changes in climatic conditions such as varying planting dates, using irrigation, or growing crop varieties suitable to the predicted climatic conditions.

Information concerning climate change forecasting, adaptation options and other agricultural production activities remains an important factor affecting use of various adaptation measures for most farmers. Lack of and or limitations in information (seasonal and long-term climate changes and agricultural production) increases high downside risks from failure associated with uptake of new technologies and adaptation measures [18, 19]. Availability of better climate and agricultural information helps farmers make comparative decisions among alternative crop management practices and this allows them to better choose strategies that make them cope well with changes in climatic conditions [20].

3. Farm Based Organizations (FBOs)

The incentives for FBO formation are accessing social and economic benefits that are greater than what may be achieved without collective action. FBOs give farmers bargaining power in the market place, enable cost-effective delivery of extension services, and empower FBO members to influence policies that affect their livelihoods. Farmers organize themselves into FBOs primarily to improve their chances of receiving training, grants, and loans and to collectively engage in economically beneficial activities. FBOs interested in economic activities look to the profits from the activities as a primary or supplementary source of income. If the goal of an FBO is to make the members economically better off, guiding them to economically viable activities may be more beneficial than building capacity through training [21]. The most common training received by groups are in agricultural practices, bookkeeping, and leadership.

4. Extension support

Agricultural extension or agricultural advisory services, comprises the entire set of organizations that support people

engaged in agricultural production and facilitate their efforts to solve problems; link to markets and other players in the agricultural value chain; and obtain information, skills, and technologies to improve their livelihoods [22, 23]. Extension visits afford the farmers the opportunity to learn improved technologies and how to acquire the needed inputs and services.

Access to free extension services significantly increases the probability of taking up adaptation options except moving from farming to non-farming. Extension services provide an important source of information on climate change as well as agricultural production and management practices [24]. Farmers who have significant extension contacts have better chances to be aware of changing climatic conditions and also of the various management practices that they can use to adapt to changes in climatic conditions [24]. Improving access to extension services for farmers has the potential to significantly increase farmer awareness of changing climatic conditions as well as adaptation measures in response to climatic changes.

5. Access to loans

Access to affordable credit increases financial resources of farmers and their ability to meet transaction costs associated with the various adaptation options they might want to take. With more financial and other resources at their disposal, farmers are able to change their management practices in response to changing climatic conditions and other factors and are better able to make use of all the available information they might have on changing conditions, both climatic and other socioeconomic factors [4]. For instance, with financial resources and access to markets farmers are able to buy new crop varieties, new irrigation technologies, and other important inputs they may need to change their practices to suit the forecasted and prevailing climatic conditions.

6. Access to irrigation

The irrigation system consists of a main intake structure or pumping station which is mostly drawn from water source, a conveyance system, a field application system and/or a drainage system [4]. Access to irrigation facilities helps improve participation and decision making by the poor, at both micro- and meso-levels [25]. Farmers' involvement in irrigation management and decision making delivers direct benefits at farm household level, and indirect benefits at system level. Household-level benefits accrue in terms of higher water productivity, profitability, and labor savings due to higher water use efficiency, improved maintenance, and accountability in system management. These effects may translate into system-wide benefits, thereby improving the overall performance of irrigation systems and promoting its sustainability.

7. Storage facilities

Constructing on-farm storage facilities can help farmers succeed financially by giving them greater control over their products and their timing of marketing. Availability of storage facilities help reduce post-harvest losses and encourage farmers to continue to increase their level of productivity.

8. Adaptive strategies on floods and droughts

Several strategies on floods and droughts have been considered by various farmers over the years. Drawing upon a series of shared learning dialogues with affected communities, non-government organizations and local government officials, researchers have come up with a number of soft and hard resiliency measures which reduce vulnerability to natural hazards. These measures take into account the unique interplay among physical, social, economic and political relationships. The ability to reduce vulnerability to disasters is related to the robustness of the systems [26]. These systems include: the presence of diversified media and accessibility of information about weather in general and hazards in particular and access to a range of economic and livelihood options.

The three components of vulnerability (exposure, sensitivity, adaptive capacity) as well as their determinants are specific to place and system and they can vary over time (i.e. they are dynamic), by type and by climatic stimuli such as increasing temperature, droughts, etc [12, 13]. Thus, vulnerability is context-specific, and the factors that make a system vulnerable to the effects of climate change depend on the nature of the system and the type of effect in question, i.e. the factors that make farmers in semi-arid Africa vulnerable to drought will usually not be identical to those that make farmers in Northern Europe vulnerable to extreme weather events [10, 13-27].

In general, women tend to have more limited access to assets such as physical, financial, human, social, and natural capital that would enhance their capacity to adapt to climate change [28]. Thus, any climate adaptation strategy should include actions to build up women's assets. Interventions should pay special attention to the need to enhance women's capacity to manage risks with a view of reducing their vulnerability and maintaining or increasing their opportunities for development [29]. Ways to reduce climate-related risks for women include improving their access to skills, education, and knowledge; strengthening their ability to prepare for and manage disasters; supporting their political ability to demand access to risk-management instruments; and helping households gain greater access to credit, markets and social security.

Despite the many challenges they face, women are already playing an important role in developing strategies to cope with climate change. They have always been leaders in community revitalization and natural resource management, and there are countless instances where their participation has been critical to community survival.

3. Methodology

The research approach employed for this study was survey method. The population for the study was all women farmers in the Agona West Municipal Assembly in the Central Region of Ghana. The target population for the study was 291 which were sampled based on Krejcie and Morgan's table for determining sample size out of 1200 women crop farmers in the Agona municipality [30]. The main tool used for data collection was questionnaires, through open and closed ended questions from women farmers in the Agona Swedru, Nkum, Abodom, Bobikuma, Nyakrom and Ostenkorang communities.

The researchers applied statistical analysis to the data collected from the field through the use of questionnaire in the study. A vulnerability index was developed using indicators from the Human Development Index (HDI). Construction of vulnerability index for the women farmers consisted of several steps. Indicators used in measuring the level of adaptive capacity include involvement in farm based organizations, training in climate change issues, access to loan, access to agricultural extension services, access to seed and grain storage facilities, access to irrigation facilities, adaptation strategies to flood, and adaptation strategies to drought.

4. Findings and Discussions

The level of adaptive capacity was measured using the following indicators: farming experience, weather information availability and accessibility, availability of Farm Based Organization (FBO) training received from FBOs, access to loan facilities, access to extension services and support, access to irrigational facilities, access to storage facilities and availability of adaptive strategies to floods and droughts.

4.1. Farming Experience

Data received from the surveyed women crop farmers indicated that the women crop farmers have been farming for a minimum of 5 years and a maximum of 40 years. Specifically, about 2.6% had a farming experience of between 33 to 41 years, 7.4% had been farming for about 24 to 32 years, and 21.9% and 68.1% had been in farming for 15 to 23 years and 5-14 years respectively. Table 1 shows the farming experience of the sampled population on their farmlands.

Table 1. Farming experience of respondents of Agona West Municipality.

Farming experience (Years)	Frequency	Percent	Cumulative Percent
33-41	7	2.6	2.6
24-32	20	7.4	10.0
15-23	59	21.9	31.9
5-14	184	68.1	100.0
Total	270	100.0	

Source: Field data, 2015.

About 68.1% of the respondents have been farming between 5 to 14 years with only 2.6% of the population experiencing over 33 years of farming. Farming experience enables a famer to equip herself with the necessary information needed to increase their adaptive capacity. In agreement to a study on *Micro-level analysis of farmers' adaptation to climate change in South Africa,* farmer experience increases the probability of uptake of all adaptation options. Highly experienced farmers are likely to have more information and knowledge on changes in climatic conditions and crop and livestock management practices. Experienced farmers are usually leaders and progressive farmers is rural communities and these can be targeted in promoting adaptation management to other farmers who do not have such experience and are not yet adapting to changing climatic conditions. Making use of local successful lead farmers as entry points in promoting adaptation among smallholder farmers can have significant positive impacts in increasing use of various adaptation options [24].

4.2. Availability and Accessibility of the Weather Forecast

Out of 291 surveyed respondents, about 60.1% of the farmers indicated that they had access to the weather forecast through the media especially by radio, extension officers, neighbours and spouses whilst 39.9% of them specified that they receive no prior information of weather conditions but relied on intuition. With over 60% having access to weather forecast, most of the surveyed women farmers would have improved and high adaptive capacity. This confirms an assertion by Madison (2006) that farmers who are aware of changes in climatic conditions have higher chances of taking adaptive measures in response to observed changes. A study on Economic Impact of Climate Change on Crop Production in Ethiopia: Evidence from Cross-Section Measures published in Journal of African Economies also discovered that information on climate change increased adaptation which contributes to a reduction in vulnerability to climate change [31]. A Paper presented at Climate Adaptation net conference on a topic *"Adaptation of agricultural production systems to*

climate variability and climate change: lessons learned and proposed research approach" also support the findings by asserting that availability of better climate and agricultural information helps farmers make comparative decisions among alternative crop management practices and this allows them to better choose strategies that make them cope well with changes in climatic conditions [32].

4.3. Availability of Farm Based Organizations (FBOs)

Table 2 below briefly illustrates the responses received from the respondents on farm based organisations

Table 2. Availability of farm based organizations.

Access to Farm based organization	Frequency	Percent	Cumulative Percent
Yes	128	44.0	44.0
No	163	56.0	100.0
Total	291	100.0	

Source: Field data, 2015.

Out of the 291 surveyed women farmers, about 44% of the surveyed women crop farmers indicated that they had access to farm based organizations (FBO), were actually members and 56% indicated otherwise. Their membership to farm based organizations provides them access to social, economic, and financial facilities. This finding is similar to working paper on the theme "*Farmer Based Organizations in Ghana* postulates that the goal of an FBO is to make the members economically better off; guiding them to economically viable activities may be more beneficial than building capacity through training. Moreover, the most common training received by groups are in agricultural practices, bookkeeping, and leadership [21].

4.4. Accessibility of Loans

However, 47.1% of the women crop farmers surveyed stated that they have access to loan facilities when climate stress occurs whereas 52.9% of the respondents asserted that they have no access to loans. Access to credit facilities enables farmers to improve their output and also develop alternative modes (digging of channels, wells and dams) of withstanding climate stress (flood) in order to increase their adaptive capacity. However, only less than half of the respondents have access to loans hence reducing their adaptive capacity. In similar manner, *Micro-level analysis of farmers' adaptation to climate change in South Africa* asserts that access to affordable credit increases financial resources of farmers and their ability to meet transaction costs associated with the various adaptation options they might want to take [24]. Also, with more financial and other resources at their disposal, farmers are able to change their management practices in response to changing climatic and other factors and are better able to make use of all the available information they might have on changing conditions both climatic and other socioeconomic factors. This finding also concurs with a study which proved that access to affordable credit increases financial resources of farmers and their ability to meet transaction costs associated with the various adaptation options they might want to take. With more financial and other resources at their disposal farmers are able to change their management practices in response to changing climatic and other factors and are better able to make use of all the available information they might have on changing conditions both climatic and other socioeconomic factors [24].

4.5. Extension Support

Extension support is extended to about 128 women crop farmers out of the 291 sampled population responded favourably to receiving extension services and support with 163 of the sampled population receiving no form of extension services or response. Extension services improve adaptive capacity through the provision of the right information on relevant farm practices. With most of the respondents not being able to access these services it implies that their adaptive capacity would be reduced. In congruence with *Micro-level analysis of farmers' adaptation to climate change in South Africa findings,* extension services provide an important source of information on climate change as well as agricultural production management practices. Farmers who have high extension contacts have better chances to be aware of changing climate conditions and also of the various management practices that they can use to adapt to changes in climatic conditions [24]. Farmers who have significant extension contacts have better chances to be aware of changing climatic conditions and also of the various management practices that they can use to adapt to changes in climatic conditions. Improving access to extension services for farmers has the potential to significantly increase farmer awareness of changing climatic conditions as well as adaptation measures in response to climatic changes [24].

4.6. Access to Irrigation Facilities

About 43% of the respondents accepted having access to irrigational facilities which enable them to continue production throughout the year However, 57% of them reported that they have no access to irrigational facilities. The sampled population's access to irrigational facilities is shown in the table 3 below.

Table 3. Respondents' access to irrigation facilities

Irrigation	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	125	43.0	43.0	43.0
No	166	57.0	57.0	100.0
Total	291	100.0	100.0	

Source: Field data, 2015.

It can be inferred from the table 3 that the farmers who had access to irrigation facilities improves their adaptive capacity against climate change vulnerability. Farmers' involvement in irrigation management and decision making delivers direct benefits at farm household level, and indirect benefits at system level. Household-level benefits accrue in terms of higher water productivity, profitability, and labor savings due to higher water use efficiency, improved maintenance, and accountability in system management. These effects may translate into system-wide benefits, thereby improving the overall performance of irrigation systems and promoting its sustainability

It can also be inferred from the findings that access to irrigation empowers the farmers as it helps to reduce low productivity. Similarly, research work on *Irrigation and Poverty Alleviation: Review of The Empirical Evidence International Water Management Institute, Colombo, Sri Lanka* affirm that access to irrigation facilities helps improve participation and decision making by the poor, at both micro- and meso-levels [25].

4.7. Access to Storage Facilities

Table 4. Respondents' access to storage facilities.

Storage	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	175	60.1	60.1	60.1
No	116	39.9	39.9	100.0
Total	291	100.0	100.0	

Source: Field data, 2015

From table 4 above shows that, about 175 respondents asserted having access to storage facilities such as barn and 116 stating that they do not have access to irrigational facilities. Findings postulates that, availability of storage facilities could help reduce post-harvest losses and encourage farmers to continue to increase their level of productivity. It also increases their income and enables them to build a strong adaptive capacity against climate change impacts. In agreement to these findings on-farm storage facilities can help farmers succeed financially by giving them greater control over their products and their timing of marketing [33].

4.8. Adaptive Strategies on Floods

Surveyed women crop farmers who stated that they have developed some sort of resilience to flood were about 30.3% whereas farmers who have been unable to build any form of resilience constituted 69.7% of the sampled population. Amongst the surveyed farmers who have developed adaptive strategies, some explained that they construct channels in their farms to allow faster drain of overflow when the need arises. Other farmers also developed a strategy of delaying the planting season. These included construction of channels to allow run off to drain away from their farmlands and delay in planting their crops. Findings from the research indicate that farmers develop these minor strategies to protect themselves from the devastating effects of flooding even before other bodies come to their aid. In concurrence with a similar study on Adaptive Capacity and Livelihood Resilience: Adaptive Strategies for Responding to Floods and Droughts in South Asia, the ability to reduce vulnerability to disasters is related to the robustness of the systems. These systems include: the presence of diversified media and accessibility of information about weather in general and hazards in particular and access to a range of economic and livelihood options [26]

5. Conclusions and Recommendations

A measure of adaptive capacity was done using the following indicators: experience in farming, weather information availability and accessibility, availability of Farm Based Organizations (FBOs), training received from FBOs, access to loan facilities, access to extension services and support, access to irrigational facilities, access to storage facilities and availability of adaptive strategies to floods. According to the research finding, about 2.6% of the respondents had a farming experience of above 33 years indicating their high capacity to adapt. About 60.1% had access to weather information which increases their ability to adapt. Also, about 44% had access to FBOs, 47.1% had access to loans, 128 had access to extension support, 43% and 60.1% had irrigational facilities and storage facilities respectively at their disposal and 30.3% had built some resilience against floods.

The Analysis of variance test performed on the level of adaptive capacity to climate change impacts revealed that most of the respondents fell within medium adaptive capacity ranges. This was because, though education seeks to reduce sensitivity and increase adaptive capacity, the study revealed that, most respondents were uneducated. They also postulated that, access to weather information which increases adaptive capacity was not accessible by all and this also leads to a reduced adaptive capacity. In addition, access to loan facilities is crucial in enhancing farmers' adaptive capacity.

In a bid to help the farmers equip themselves with measures

to combat the negative effects of climate change, the study recommended that, the women farmers should be encouraged to form farm based groups to strengthen and empower them to be able to secure funds and even micro insurance from financial institutions to boost their resilience or improve upon their adaptive capacity against climate change impacts.

It is also recommended that, the women farmers should be provided with irrigational facilities to enable them practice all year round farming. Reservoirs and dams should also be built to collect and retain water when it rains to be used on the farms when the rains cease. Storage facilities should also be provided for the women farmers to enable them reduce postharvest losses and also increase their earnings.

Extension agents should also be trained on climate change science to enable them pass adequate information to farmers on appropriate adaptation measures or strategies. It is also recommended that, government through the extension services to ensure improvement in the mass education of farmers to enlighten them on new technologies employed in farming and new crop varieties that are resistant either to floods or droughts since these two extremes are the most prevalent in the Agona West Municipality and Ghana as a whole.

References

[1] Usman Shakoor, U., Saboor, A., Baig, I., Anila Afzal, A., & Rahman, A. (2015). Climate Variability Impacts On Rice Crop Production in Pakistan. *Pakistan J. Agric. Res*. *28* (1), 19-27.

[2] Cameron, E., Mearns, R., & McGrath, T. J. (2015). Translating Climate Change: Adaptation, Resilience, and Climate Politics in Nunavut, Canada. *Annals of the American Association of Geographers, 105* (2), 124-138.

[3] IPCC. (2012). *Managing the risks of extreme events and disasters to advance climate change adaptation*. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change. Cambridge, UK, and New York, USA, Cambridge University Press. 582 p.

[4] FAO (2012). *Country Statistics: Ghana*. Last accessed in 2014. Available at http://www.countrystat.org/gha/cont/pages/page/indicators/en

[5] African Development Fund (2008). *Ghana Country Gender Profile*. Human Development Department.

[6] Peterman, A., Behrman, J., & Quisumbing, A. (2010). A review of empirical evidence on gender differences in non-land agricultural inputs, technology, and services in developing countries. *International Food Policy Research Institute (IFPRI), 11* (11), 1-42.

[7] Agona West Municipal Assembly (2013). *Four-Year Medium Term Development Plan* (2010-2013).

[8] Fellmann, T. (2012). The assessment of climate change related vulnerability in the agricultural sector: Reviewing conceptual frameworks. FAO/OECD Workshop on Building Resilience for Adaptation to Climate Change in the Agriculture sector. Accessed online on 24th June, 2014.

[9] UN Women. (2014). World Survey on the Role of Women in Development: Gender Equality and Sustainable Development. New York.

[10] Brooks, N. (2003). *Vulnerability, risk and adaptation: A conceptual framework'*. Lamb.

[11] Smit, B., Pilifosova, O., 2003. From adaptation to adaptive capacity andvulnerability reduction. In: Smith, J. B., Klein, R. J. T., Huq, S. (Eds.), *Climate Change, Adaptive Capacity and Development*. ImperialCollege Press, London.

[12] Smit, B., & Wandel, J. (2006). Adaptation, adaptive capacity and vulnerability. *Global Environmental Change*, 16, 282-292.

[13] Adger, W. N., Arnell, N. W., & Tompkins, E. L., (2005). Successful adaptation to climate change across scales. *Global Environmental Change* 15, 77–86.

[14] Engle, N. L. (2011). Adaptive capacity and its assessment. *Global Environmental Change*, 21: 647–656.

[15] Gbetibouo, G. A., & Ringler, C. (2009). *Mapping South African farming sector vulnerability to climate change and variability, a sub national assessment*. International Food Policy Research Institute (IFPRI) Discussion Paper 00885.

[16] Moser, C. (2008). "Assets and livelihoods: A framework for asset-based social policy" in C. Moser and A. Dani (eds) *Assets, Livelihoods and Social Policy*, World Bank, Washington D. C.

[17] Maddison, D. (2006). *The perception of and adaptation to climate change in Africa*. CEEPA, Discussion Paper No. 10., Center for Environmental Economics and Policy in Africa, Pretoria, South Africa: University of Pretoria.

[18] Jones, R., (2001). An environmental risk assessment/management frame-work for climate change impact assessments. *Natural Hazards*, 23, 197–230.

[19] Kandlinkar, M. & Risbey, J. (2000) Agricultural Impacts of Climate Change. If Adaptation Is the Answer, What Is the Question? *Climate Change*, 45, 529-539.

[20] Baethgen, W. E. (2003). A basis for crop insurance programs in Uruguay: variability of crop yields obtained by farmers and estimation of catastrophic yields in Uruguay.

[21] Salifu A., Funk Lee R., Keefe M., & Kolavall S. (2012). *Farmer Based Organizations in Ghana*. International food policy research institute, working paper 31.

[22] Ignaciuk, A. (2015), "Adapting Agriculture to Climate Change: A Role for Public Policies", *OECD Food, Agriculture and Fisheries Papers, No. 85*, OECD Publishing, Paris.

[23] Davis, M. C., & Challenger, R. (2009). Climate change – Warming to the task. *The Psychologist*, 22, 112-114.

[24] Nhemachena, C., & Hassan, R. (2007). *Micro-level analysis of farmers' adaptation to climate change in South Africa.* IFPRI discussion paper No. 00714. International Food Policy Research Institute, Washington, D. C.

[25] Hussain, I., & Hanjra, M. A. (2004). *Irrigation and Poverty Alleviation: Review Of The Empirical Evidence International Water Management Institute, Colombo, Sri Lanka*. Published Online In Wiley Interscience (www.interscience.wiley.com). Doi: 10.1002/Ird.114

[26] Moench, M., & Dixit, A. (2004). *Adaptive Capacity and Livelihood Resilience: Adaptive Strategies for Responding to Floods and Droughts in South Asia*. Institute for Social and Environmental Transition, Boulder and ISET-Nepal, Kathmandu.

[27] Challinor, A., Wheeler, T., Garforth, C. (2007). Assessing the vulnerability of food crop systems in Africa to climate change. *Climatic Change,* 83, 381–399.

[28] Aguilar, L. (2009) *How natural disasters affect women*. Costa Rica: IUCN, UNDP, GGCA.

[29] Worldwatch Institute, (2012). State of the world 2009: Confronting climate change ed. 26, revised. Routledge 2012. ISBN 1136556788, 9781136556784

[30] Krejcie and Morgan's (1970) table for determining sample size

[31] Deressa, T. T., & Hassan, R. M. (2009). Economic Impact of Climate Change on Crop Production in Ethiopia: Evidence from Cross-Section Measures. *Journal of African Economies*, *18,* 529-554.

[32] Baethgen, W. E., Meinke, H., & Gimene, A. (2003). *Adaptation of agricultural production systems to climate variability and climate change: lessons learned and proposed research approach.* Paper presented at ClimateAdaptation. net conference "Insights and Tools for Adaptation: Learning from Climate Variability," 18-20 November, 2003, Washington.

[33] National Sustainable Agricultural Coalition (2014), on-farm storage facilities